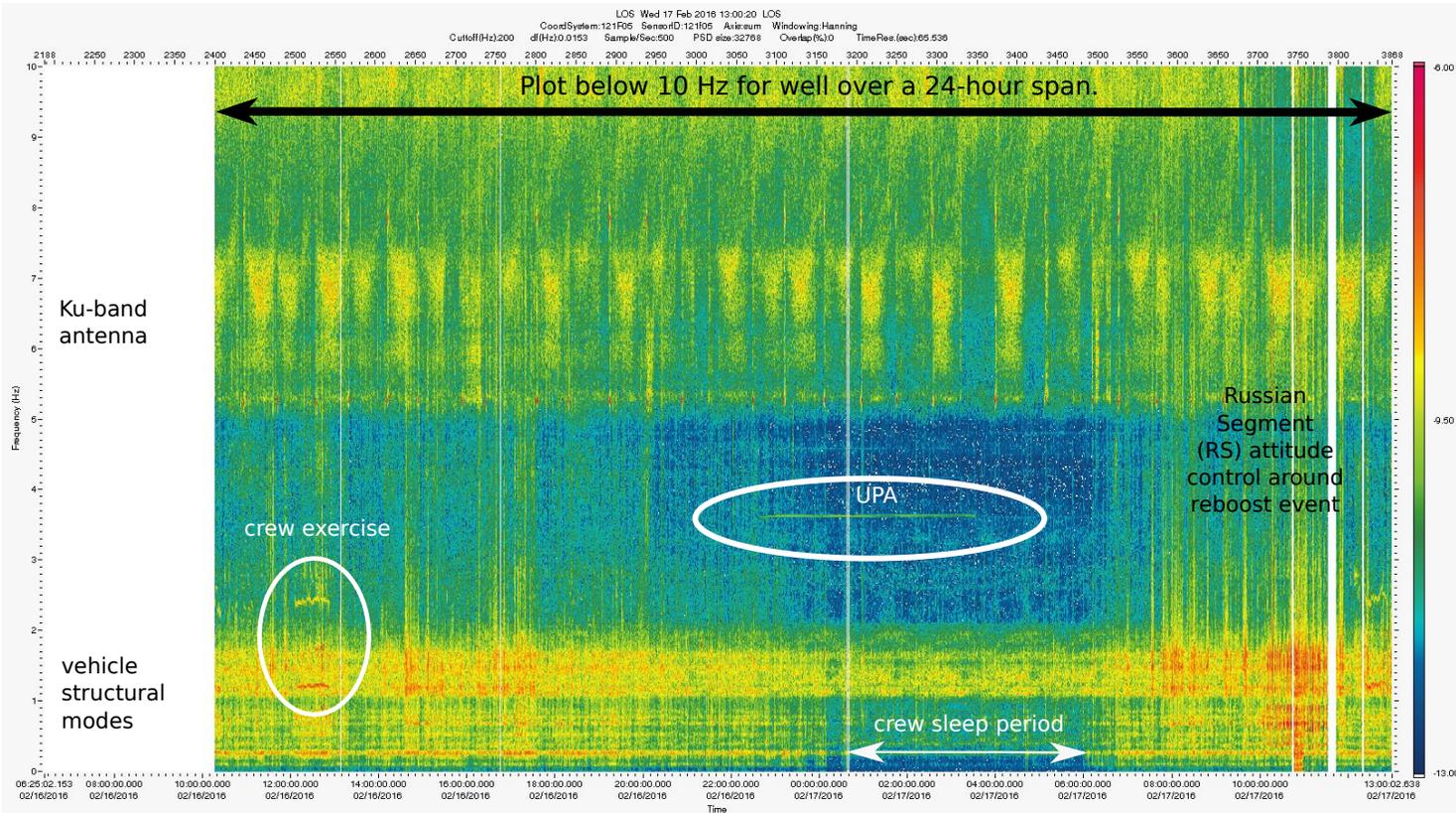


## Progress 61P Reboost 2016-02-17 Qualify

Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL Endcone
Plot Type	Spectrogram

### Notes:

- This plot serves as good overview of events leading up to the reboost.
- Note that below 10 Hz, the typical dominant disturbances are identified as the Ku-band antenna, crew exercise, and vehicle structural modes.
- In this spectrogram, we also highlight the spectral impact of the Urine Processing Assembly (UPA), the crew sleep period (quieting), and Russian attitude control.



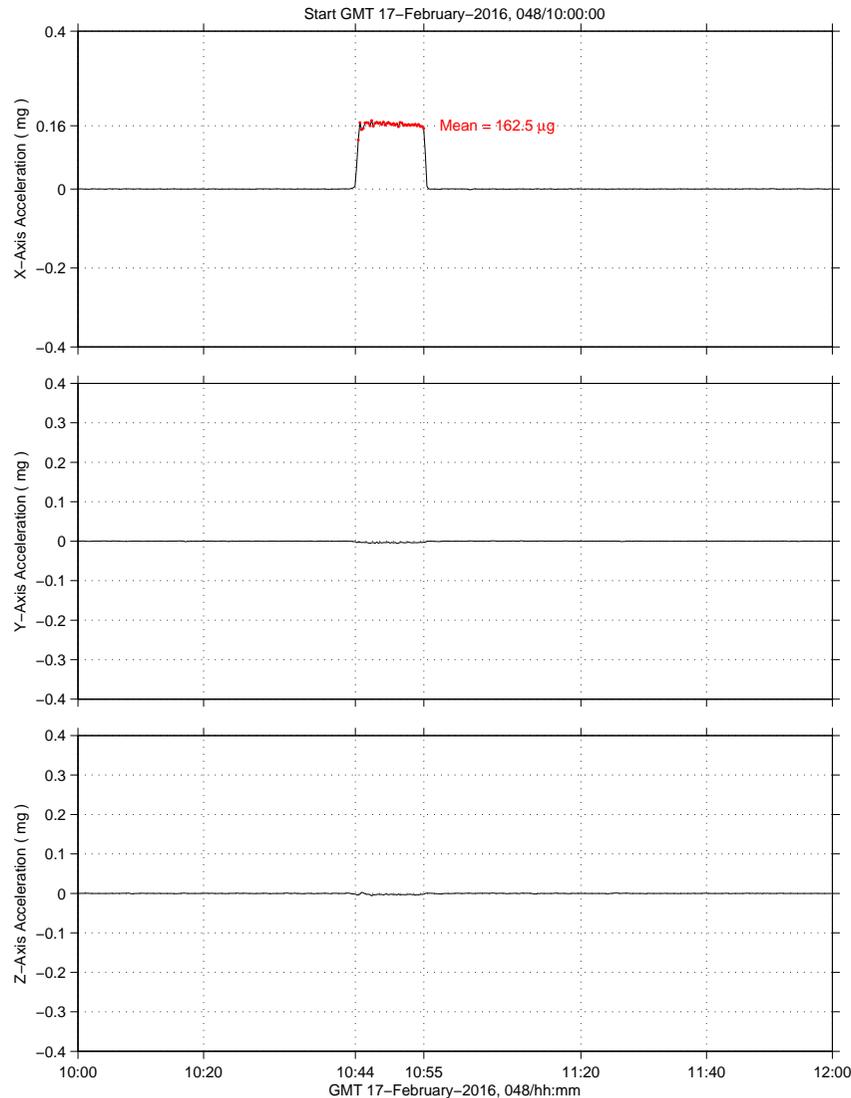
Regime:	Vibratory
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17



## Progress 61P Reboost 2016-02-17 Quantify

mams\_ossbtmf at LAB1O2, ER1, Lockers 3,4 [135.28 -10.68 132.12]  
0.0625 sa/sec (0.01 Hz)      mams\_accel\_ossbtmf, LAB1O2, ER1, Lockers 3,4, 0.0 Hz (0.1 s/sec)      SSAnalysis[ 0.0 0.0 0.0]

$$\Delta V = ((162.5 \times 10^{-6} \times 9.81) \times 10.67 \times 60) = 1.02 \text{ m/s}$$

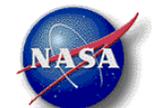


Description	
Sensor	MAMS ossbtmf 0.0625 sa/sec, 0.01 Hz
Location	LAB1O2, ER1, Lockers 3,4
Plot Type	XYZ Accel. vs. Time

### Notes:

- The primary objective of a reboost is to impart a “delta-V” in the forward direction of flight.
- This plot of very low frequency, quasi-steady, data measured by MAMS shows the salient feature.
- During the reboost, there is a relatively large step in the +XA-direction (forward flight direction) as seen on this plot.
- MAMS gives us the most accurate indication of the quasi-steady regime, so we show this plot for completeness.
- The red text shows the step was about 160 ug as seen on the X-axis.
- The main metric that flight controllers track for reboost is the so-called “delta-V”, which MAMS registered as 1.02 m/s. This increase in velocity in the flight direction boosts the space station's altitude.

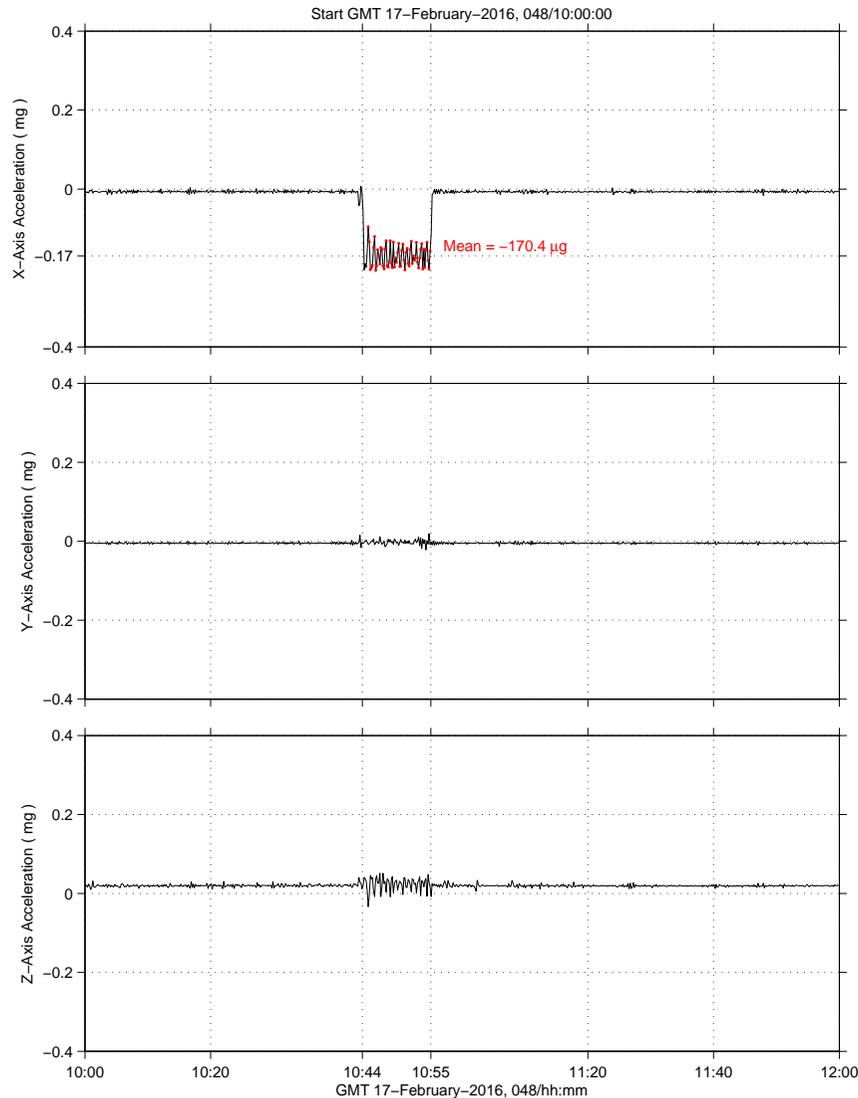
Regime:	Quasi-Steady
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17



## Progress 61P Reboost 2016-02-17 Quantify

sams2, 121f05 at COL, Starboard Endcone, Adapter Bracket:[378.90 320.60 233.90]  
 0.1000 sa/sec (200.00 Hz) SAMS2, 121f05, COL, Starboard Endcone, Adapter Bracket, 200.0 Hz (500.0 s/sec) SSAnalysis[0.0 0.0 0.0]  
 Interval Average  
 Size: 10.00, Step: 10.00 sec.

$$\Delta V = ((-170.4 \times 10^{-6}) \times 9.81) \times 10.00 \times 60 = -1.00 \text{ m/s}$$



Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL Endcone
Plot Type	Interval Average

### Notes:

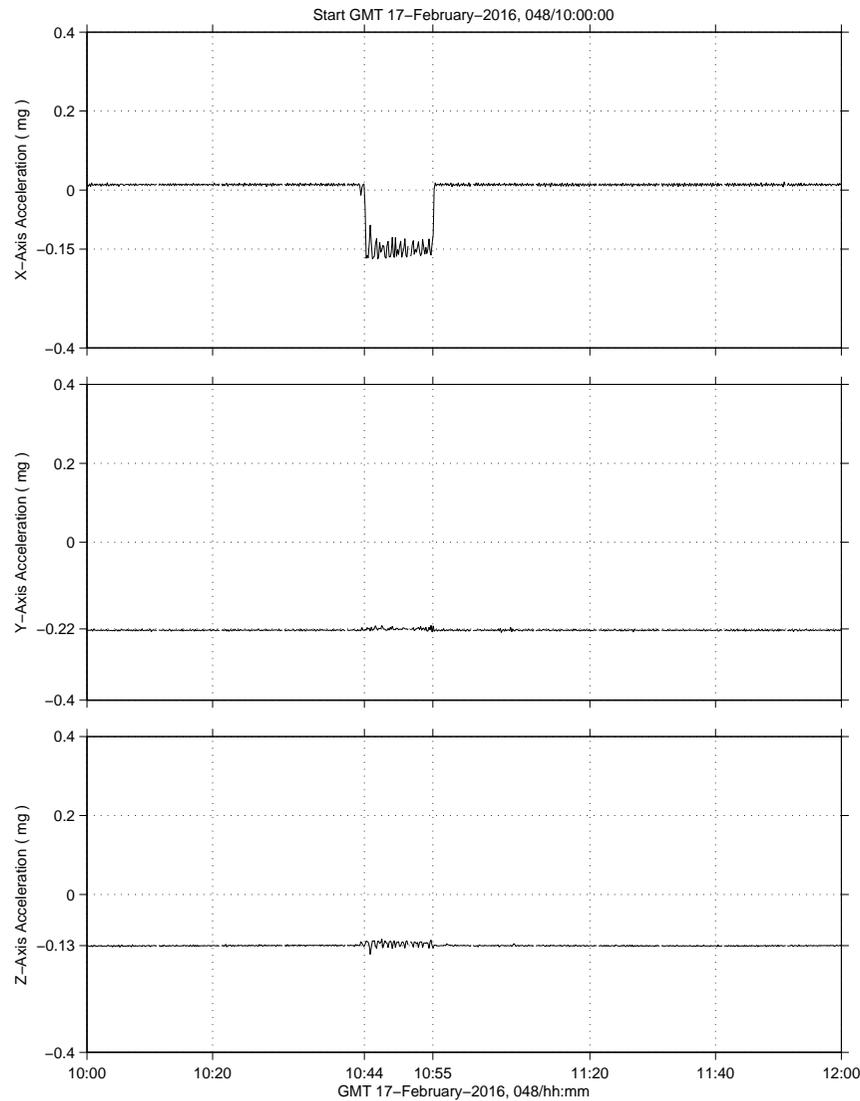
- The SAMS sensors are not intended to give us high fidelity in the quasi-steady regime. SAMS sensors are typically specified with a pass-band (nominally) of 0.01 Hz to 200 Hz.
- For curiosity and comparison sake, we plot the SAMS SE-F05 data recorded on the Columbus starboard endcone in the form of an interval average (every 10s).
- From this interval average plot, we can see 2 main features in the SAMS SE-F05 data:
  - A notable step on the XA-axis in the **negative direction (opposite of what MAMS showed us)**.
  - Step size of about 170 ug (close to the value registered by MAMS).
- The negative direction for the step in SAMS data is due to the fact that you have to invert SAMS polarity on all 3 axes to get the proper directionality.

Regime:	Quasi-Steady
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17



## Progress 61P Reboost 2016-02-17 Quantify

sams2, 121f03 at LAB1O1, ER2, Lower Z Panel:[191.54 -40.54 135.25]  
 0.1000 sa/sec (200.00 Hz) SAMS2, 121f03, LAB1O1, ER2, Lower Z Panel, 200.0 Hz (500.0 s/sec) SSAnalysis[ 0.0 0.0 0.0]  
 Interval Average  
 Size: 10.00, Step: 10.00 sec.



Description	
Sensor	SAMS 121f03 500.0 sa/sec, 200.0 Hz
Location	LAB1O1, ER2, Lower Z Panel
Plot Type	Interval Average

**Notes:**

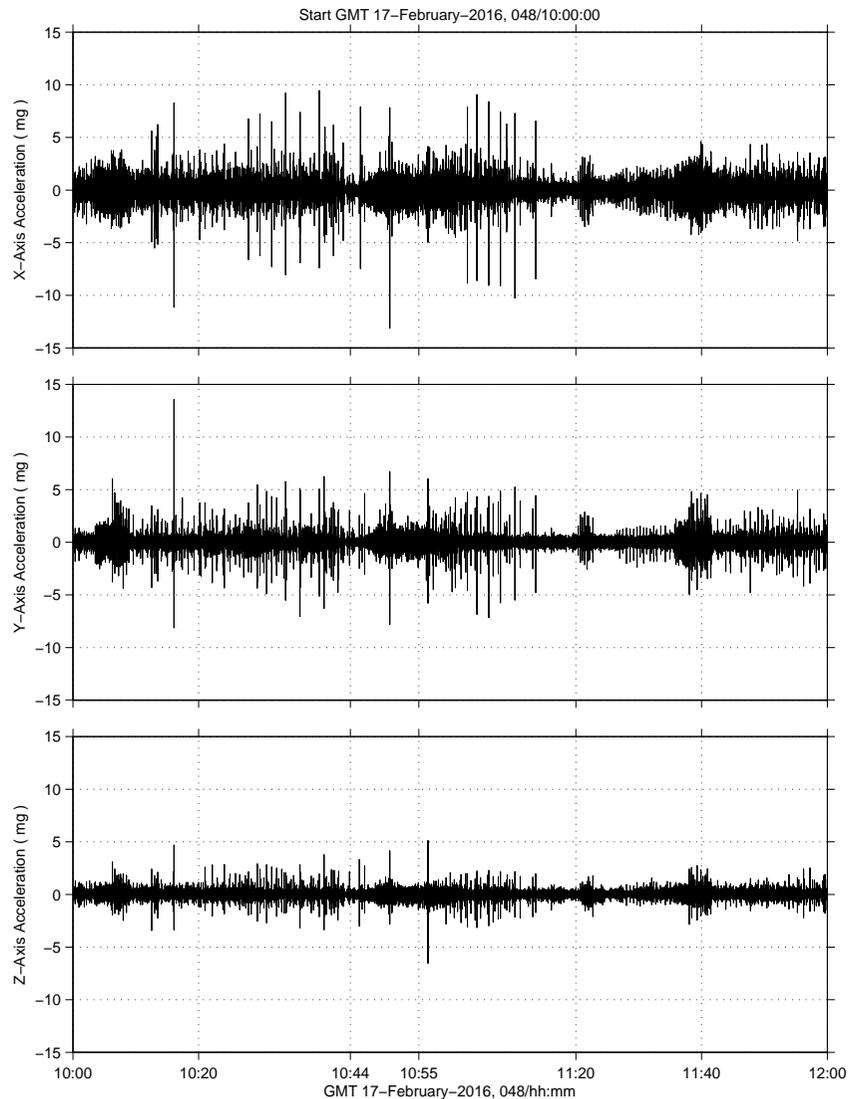
- This plot is identical to the previous page except we use SAMS SE-F03 data measured in the USL.
- Again, this is not the best way to quantify the quasi-steady impact of a reboost, but we show this for comparison and completeness.

Regime:	Quasi-Steady
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17



## Progress 61P Reboost 2016-02-17 Quantify

sams2, 121f05 at COL, Starboard Endcone, Adapter Bracket:[378.90 320.60 233.90]  
500.0000 sa/sec (200.00 Hz) SAMS2, 121f05, COL, Starboard Endcone, Adapter Bracket, 200.0 Hz (500.0 s/sec) SSAnalysis[0.0 0.0 0.0]



Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL Endcone
Plot Type	XYZ Accel. vs. Time

### Notes:

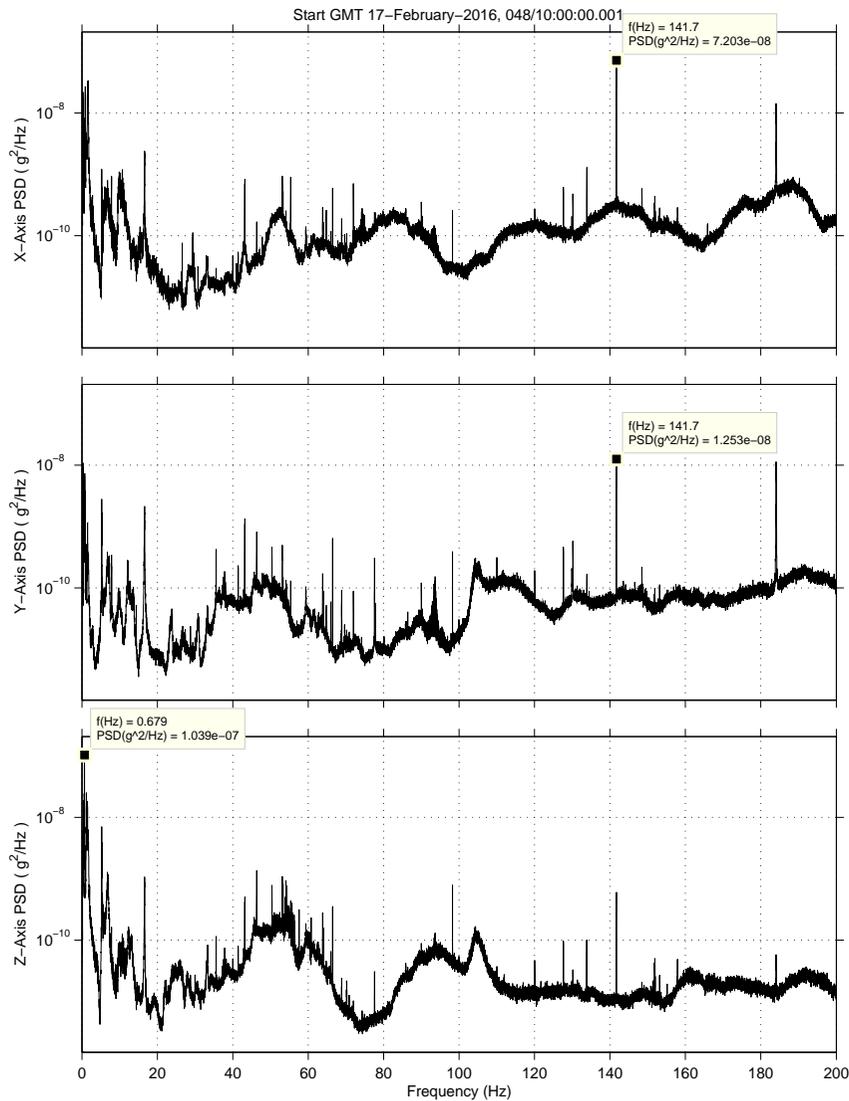
- This 3-panel plot shows as-measured SAMS SE-F05 data up to the cut-off frequency (200 Hz) of the sensor.
- It shows the same span as the previous 2 plots, and has the same time-axis labels.
- The quasi-steady nature of a reboost is totally obscured by much higher frequency disturbances.
- We do note that the XA-axis has overall larger peak-to-peak acceleration values and we further identify that on the next page.

Regime:	Vibratory
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17



## Progress 61P Reboost 2016-02-17 Quantify

sams2, 121f05 at COL, Starboard Endcone, Adapter Bracket:[378.90 320.60 233.90]  
 500.0000 sa/sec (200.00 Hz) SSAnalysis[0.0 0.0 0.0]  
 $\Delta f = 0.008$  Hz, Nfft = 65536 SAMS2, 121f05, COL, Starboard Endcone, Adapter Bracket, 200.0 Hz (500.0 s/sec) Hanning, k = 107  
 P = 49.1%, No = 32192 Span = 7200.00 sec.



Description	
Sensor	SAMS 121f05 500.0 sa/sec, 200.0 Hz
Location	COL Endcone
Plot Type	Power Spectral Density

### Notes:

- This plot of power spectral densities shows via boxed annotations where the largest spectral contributor was during this 2-hour span.
- The XY-plane was experiencing mostly a narrowband disturbance at about 141.7 Hz.
- The Z-axis was dominated by a spectral peak at about 0.6 Hz – this is most likely a structural mode.

Regime:	Vibratory
Category:	Vehicle
Source:	Progress 61P Reboost 2016-02-17

